Components in wireless technology, 5XTC0

Design of RF building blocks
Study guide

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Where innovation starts

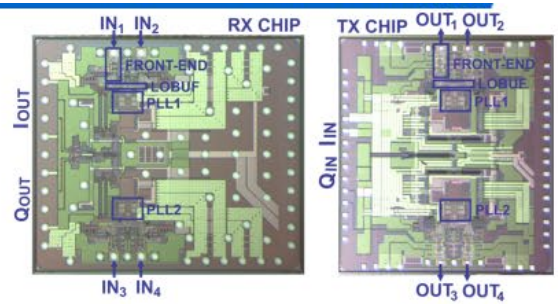
Organization of RF building blocks

- 4 weeks with each of 2 blocks of 4 hours
  - Lectures
  - Exercises
    - to practice theory from lectures
  - Labs
    - to get familier with measurement equipment and practical aspects of amplifier design
  - Complete course information is available in CANVAS

Vojkan professional profile

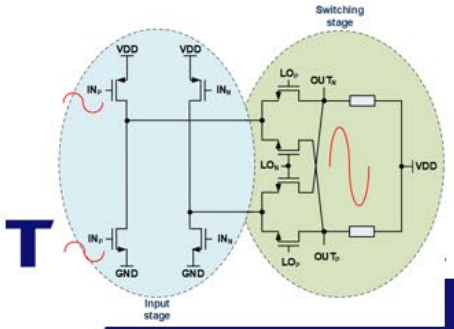
Jan 2020 - Now	**Associate Professor** Department of Electrical Engineering, IC Group RF/mm-wave circuits/systems Electronics in plants
Aug 2013 – Jan 2020	**Member of Technical Staff** 2G/3G/4G/5G/mm-wave transceivers Circuit/System/Architecture/Technical lead Member of Intel patent committee
Apr 2009 – Aug 2013	**Principle researcher** mm-wave transceivers
Oct 2007 – Apr 2009	**Senior RF IC Design Engineer** DECT receivers with high linearity
Jan 2005 – Oct 2007	**Research Scientist** DPLL mm-wave
Sep 2004 – Jan 2005	**Postdoc, TU/e** Multi-band LNAs
Sep 2000 – Sep 2004	**Ph.D. studies** Multi-standard receivers

60 GHz TX & RX



BOOKS

1V MIXER

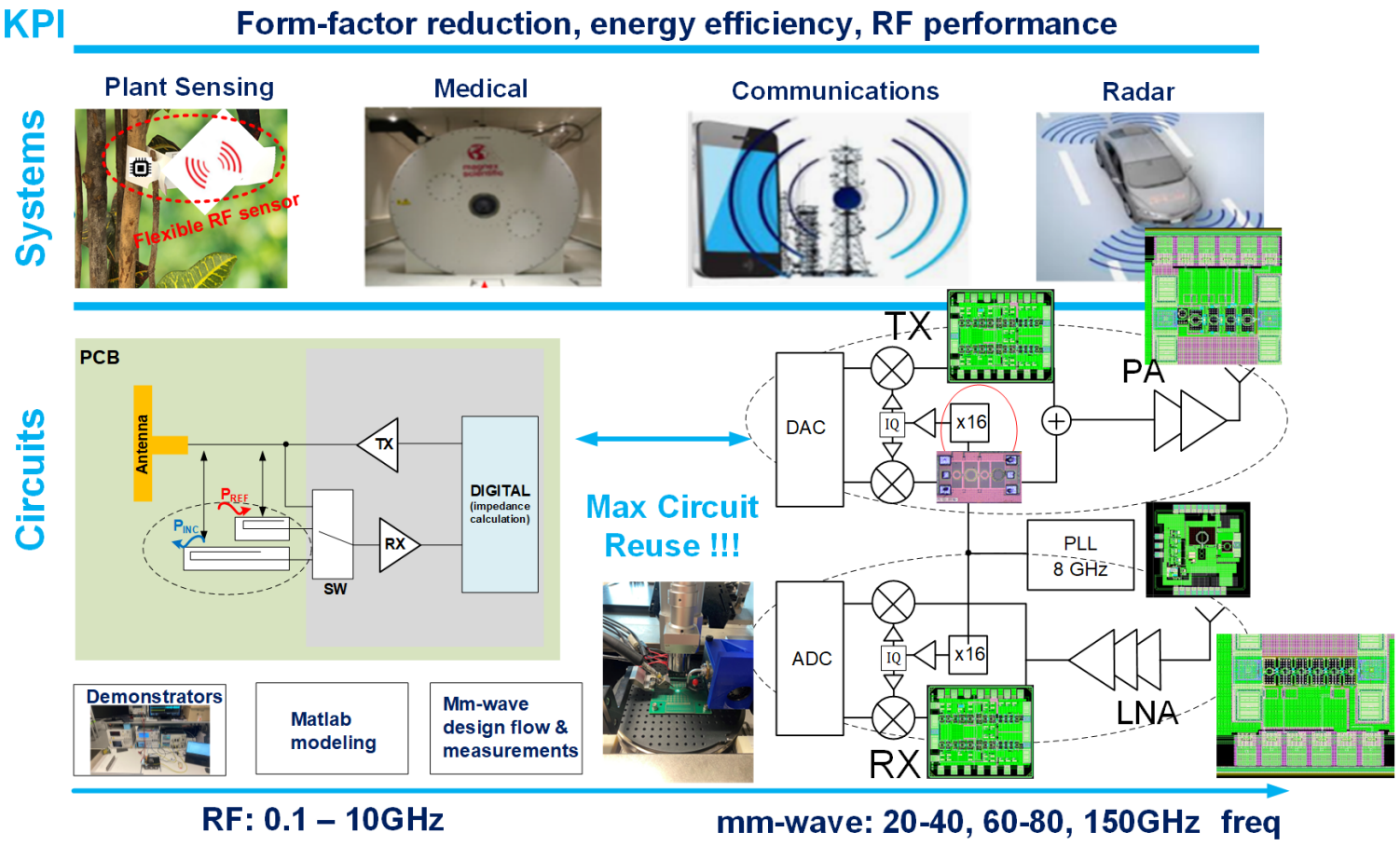


IC group: RF sensing & communication lab

Scope
RF & mm-wave circuits for sensing & communications

Vision
From concepts via circuits/building blocks to systems & demonstrators

Way of working
BEP, MSc, PhD students working together as a team



Planning (1/2)

Module 4: RF amplifiers	Lecture:	RF systems and amplifier design	Mar 5, 5+6	Atlas 8.310	Vidojkovic	-
	Exercises:	Amplifier design	Mar 5, 7+8	Atlas 8.310	Vidojkovic	-
Intermediate test	**Exam**:	Course content up to and including module 3	**Mar 7, 1+2**	Neuron 0.266	Bronckers, Johannsen	Telluri, Yadav
	Lab:	Extra lab Q&A opportunity	Mar 7, 3+4	Neuron 0.266	Bronckers	Telluri, Yadav
Module 5: Low-noise amplifiers	Lecture:	Noise and LNA design	Mar 12, 5+6	Atlas 2.225	Vidojkovic	-
	Exercises:	LNA design	Mar 12, 7+8	Atlas 2.225	Vidojkovic	-
	Lab:	QUCS amplifier design	Mar 14, 1-4	Atlas 2.225	Dommele, Vidojkovic	-

Planning (2/2)

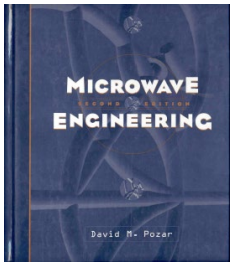
Module 6: Power amplifiers & mixers	Lecture:	Basics of PA and mixer design	Mar 19, 5+6[1]	Atlas 8.310	Vidojkovic	-
	Exercises:	Amplifier matching using distributed components	Mar 21, 1+2	Atlas 2.225	Vidojkovic	-
	Lab:	Amplifier measurements	Mar 21, 3+4 Mar 26, 5+6	Atlas 2.225	Dommele, Vidojkovic	-
Module 7: System integration	Lecture:	System-level design	Mar 26, 7+8	Atlas 2.225	Vidojkovic	-
	Exercises:	System integration and matching	Mar 28, 1+2	Atlas 2.225	Vidojkovic	-
	Lab:	System-level characteristics	Mar 28, 3+4	Atlas 2.225	Dommele, Vidojkovic	-

Objective

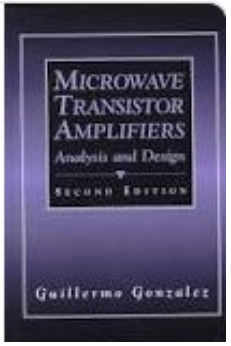
- Basic info about RF systems
- Design of RF amplifiers, particular low-noise amplifiers using S parameters addressing:
  - Gain
  - Noise
  - Stability
  - Matching
- Basic info about power amplifiers and mixers
- Systems aspects of RF systems
- Getting familiar with measurement equipment
- Getting familiar with measurements of high frequency amplifiers

Material

- Lecture slides (available on CANVAS)
- Exercises (available on CANVAS)
- Labs (instructions available on CANVAS)
- Books
  - Microwave Engineering
    - David M. Pozar
    - Chapters:
      - 12: Design of microwave amplifiers and oscillators
      - 14: Introduction to microwave systems



  - Microwave Transistors Amplifiers Analysis and Design
    - Guilermo Gonzalez
    - Chapters:
      - 1: Representations of two port networks
      - 2: Matching network and signal flow graphs
      - 3: Microwave transistor amplifier design
      - 4: Noise, broadband and high-power design methods



Contact Information

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